

FOREST HEALTH OF THE UNITED STATES' FORESTS

SECTION #1, PART #2

WHAT ARE THE FACTORS WHICH ENABLE OUR FORESTS TO ACHIEVE, OR NOT ACHIEVE, THE VARIOUS VALUES?

by the

Forest Health Science Panel

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WHAT ARE THE FACTORS WHICH ENABLE OUR FORESTS TO ACHIEVE, OR NOT ACHIEVE, THE VARIOUS VALUES?

It is first important to understand how our forests reached their present condition and so provide the present values. Then, the various factors which enable our forests to achieve the various values can be discussed.

HOW OUR FORESTS REACHED THEIR PRESENT CONDITION

Forests in the United States always have changed and always will change; however, two very important changes began about 10,000 to 14,000 years ago: the continental glacier began melting, and people moved to North America in great numbers. Before 14,000 years ago, most of Canada and the northern United States (excluding Alaska) was covered by an Ice Sheet and the sea level was much lower. Most plant and animal species lived much farther south and in different plant and animal communities than where we find them today.

The glacier's melting caused various floods, climate changes, earth shifts, and species migrations which are continuing. People moved to North America, primarily from Asia (via Alaska) beginning about 10,000 years ago.¹ They used fire and other tools to supplement natural fires in maintaining openings and savannas for managing game, farming, and protecting themselves from catastrophic fires, among other reasons. The forest was used for its wildlife, medicinal plants, fuel, building materials (wood and bark), and religious purposes. During this period, many large mammals became extinct, although it is unsure if human hunting contributed to these extinctions.

The forest remained in a constant state of flux as the forests grew; were disturbed by fires, winds, and other natural and human disturbances; were changed as plant and animal species migrated to and from the forest or became extinct; and the climate changed. Some forest areas in each region always remained in each of a variety of structures (Figure 1.3), although the location of each structure changed with time. Each structure was the result of growth and disturbance patterns. The structures can be classified many ways; however, for this report, five structures will be discussed:

--savanna: park-like areas with widely spaced, large trees with primarily shrubs and non-woody plants between them;

¹ It is uncertain if there were people here before about 10,000 years ago.

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- open: forest openings primarily covered with shrubs and non-woody plants and very small (young) trees;
- dense: forest areas of trees so crowded together that their shade prevents shrubs and non-woody plants from growing on the forest floor;
- understory: forest areas of trees less crowded, so shrubs and non-woody vegetation grows on the forest floor;
- complex: Forests containing a large range of sizes and species of trees, as well as snags, downed logs, and shrubs and non-woody vegetation growing on the forest floor.

The term “old growth” is avoided in this report, because “old growth” has been used at different times to describe forests in the “complex”, “understory”, “dense”, and “savanna” structures. Very old and/or large trees (several hundred years) were historically found in many savanna, understory, and diverse structures.

European- and African-American settlement began about 500 years ago. In what is now the eastern United States, diseases reduced the Native American population, leading to regrowing of their agricultural fields to forests as the colonists were clearing other forests for farms. Burning the forests with low intensity surface fires continued with little attempts to control the fires until about 100 years ago. Between the time of this colonization and about 120 years ago, the primary approach to forest management was liquidation in much of the eastern United States. Forests were plentiful and cleared agricultural land was highly valued. Forests were primarily used for timber, game, and other products. A few forests were set aside as “reserves” to be managed for timber and other forest products instead of liquidation. Clearing the forest became so prevalent that wood shortages began to emerge as early as 1800 (in New England).

Industrialization and population increases beginning about 150 years ago increased the demand for wood for fuel and building materials, increased the ability to transport wood and agriculture products from areas of plenty to areas of need, and increased the travel, communication, and leisure time, so people increased their appreciation of other, non-commodity values of the forest.

Increased wood use led to concerns of an impending timber shortage beginning about 100 years ago, and steps were taken to establish “reserves” where forests would be grown for timber and other values, instead of being liquidated. Active forest management was promoted to conserve and maintain products and other values from the forest.

Studies of the forest led to different ecological theories of how the forest grows. The predominant theory until the last decade was that, without humans, “nature” existed in a state of equilibrium in which a “forest grows to a beautiful, mature climax stage that becomes its naturally permanent condition.” (Stevens 1990). This “climax” stage has been assumed to be analogous to the “complex” structure of Figure 1.3. This theory “led to the doctrine, popular among

conservationists, that nature knows best and that human intervention in it is bad by definition.” (Stevens 1990). This theory was reinforced among conservationists by European philosophy and the Romanticism of the past century. Although this theory has been abandoned by most ecologists (Stevens 1990), many policymakers, conservationists, scientists in peripheral fields, members of the public, and older scientists still consciously or subconsciously accept it.

The now outdated “steady state” theory, and real concerns about fires destroying the timber and property, led to a policy of stopping of all fires--even though some scientists argued against this policy. This theory, and concerns about maintaining the “natural” beauty, also led to the establishment of small “untouched” areas in the East and larger National Parks, Wilderness Areas, and other such “reserves”² in the West which excluded active management, primarily in the West during the past 100 years.

Very large forest fires about 70 to 110 years ago in the North, Inland West, and Pacific Coast created large areas in the open stand structure. Subsequent, controllable ground fires have been excluded from these lands. As a consequence, they have regrown to very crowded forests of small diameter trees. At the same time, improvements in agriculture and transportation allowed farming and animal husbandry to be concentrated on the best soils. Farming on poor soils and sheep grazing in forests in the West declined dramatically from about 1900 to 1960. These abandoned farms and grazing areas also regrew to very crowded stands of small diameter trees. Various incentive, information, and research programs promoted growth of forests (“tree farms”) instead of agricultural crops. These programs were generally based on the agricultural model of intensive efforts of short duration.

Fossil fuels began to replace wood (and charcoal) as fuels between 1900 and 1940, while the manufacture of paper from wood increased. Early forest management, about 1900 to 1930, was an attempt to sustain the forest by protecting it from fires and inappropriate timber harvest (which led to “high grading”, insects, and/or unintended fires) and grazing. In the 1930’s and 1940’s, forest management attempted to be compatible with both ecological theory and logging economics, and so tried various forms of uneven-aged harvesting. This system followed the steady state ecological theory that, since the “natural” condition was a “steady state” or “climax” (assumed to be the “complex” structure of Figure 1.3), with individual trees dying and being replaced in an equilibrium manner, this condition could be mimicked through forest management by cutting the largest trees in each forest and allowing the

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remaining, smaller trees to grow. This harvest technique was agreeable to loggers who cut the most valuable, large trees and left the least valuable ones. This “high grading” was especially common in mixed species forests and is still continuing in places--hardwood forests in the North and South and conifer forests in the Inland West. It generally created slow growing, shade tolerant, disease-infested (and often fire-prone) stands which did not sustain timber, but did produce “complex” structures.

Successes with regrowing even-aged forests on abandoned fields and burned areas led to a shift to even-aged management in the 1950's. Increased wealth and demand for timber led to increased harvesting and intensive management. Forestry became more heavily based on financially efficient approaches of maximizing timber volume through intensive management and relatively short rotations. Even-aged management began to be regarded as the only biologically feasible way to manage, rather than as one of many methods. Old forests in the complex, understory, or savanna structures were regarded as “excess inventory.” The trees were rotting and dying in these older forests as rapidly as they were growing. As long as the “impending timber shortage” was expected (and the primary reason for management), it was prudent to harvest the timber before it died and replace the stand with a vigorously growing, young forest.

The expectation of a timber shortage lasted into the 1980's. Like the outdated concept that forests exist as a stable “steady state”, complex structure unless disturbed by people, realization that there is not a timber shortage has not been consciously or unconsciously accepted by many policymakers, conservationists, scientists in peripheral fields, members of the public, and older scientists.

The “impending timber shortage” has been avoided by shifts to fossil fuels; importing of timber and wood products; use of substitute products (e.g., steel, aluminum, brick, concrete, and plastic); managed regeneration of abandoned agriculture, grazing, burned and harvested land; and utilization of smaller trees and more species through technological innovations. For each of the past four decades, the United States has been consuming more wood than the previous decade, but is growing even more wood than it is consuming.

Intensive forest management including thinning, pruning, and long rotations to produce high quality timber is generally not considered financially efficient--especially with certain tax and other disincentives. Most of the remaining large diameter, high quality timber is on National Forests--in dense, understory, and complex forests; and these forests are under contention between users of high quality timber and those wanting to maintain the forest in a “steady state.”

Scientists now realize that the assumptions behind intensive management of the forest and preserving the forest are both wrong. There is not an

impending timber shortage which will cause timber management to be profitable enough to subsidize all other values. And, setting the forest aside will not ensure it will grow to a stable condition, or one which will provide habitats for all species.

At the same time, the forest can still provide both commodity and non-commodity values which society needs. Timber grown in the United States can be very environmentally sound to substitute for more fossil-fuel consuming (and carbon dioxide-producing) products and to keep wood from being imported from countries in the world with fewer environmental safeguards on forest management. It can not be taken for granted that domestic forests will be grown and utilized, however.

Different animal and plant species depend on the different forest structures, and there are threatened and endangered species in each region which depend on the savanna, open, understory, and complex structures (Figure 1.3). All of these structures are valuable--but they will not necessarily be achieved by excluding human activities from the forest.

Many of the legal, educational, social, and economic factors influencing forest management in the United States have been developed over the past century and are based on the outdated assumptions of an impending timber shortage and the steady state ecological theory. It is important to reassess the basis for forest management before trying to adjust individual laws.

This part of the report introduces the factors to be considered when trying to manage the forests to achieve the different values. Before ways to achieve these factors are pursued, however, it is important to understand the extent that the forest is presently providing the various values people want (Part # 3). Then, different ways can be examined to provide the desired values. Part # 4 will describe several, alternative approaches to managing our forests--and the effects of each approach on each value. Policymakers will need to decide among these approaches, based on this report and its review by other scientists. Once approaches to management are agreed upon, the specific factors can be examined and legislative objectives described to implement the approaches.

FACTORS WHICH ALLOW OUR FORESTS TO ACHIEVE THE VARIOUS VALUES

Many biological and non-biological factors have contributed to the current conditions of forests in the United States. These factors can be considered as obstacles or aids in achieving the desired condition, depending both on what the desired condition is and how the factor is used.

Identification of the most important factors can indicate what factors can be changed to influence the condition of the forests.

The factors are interacting, but can roughly be divided into five groups:

- 1. Social factors:** Influences based on the cultures of people. Cultural influences generally change over time, rather than being subject to immediate change. These can be divided into three components:
 - A. Public/other landowner pressures:** Pressures to do, or not do, certain activities can be both informal social pressures and formal, liability pressures.
 - B. Landowner liability:** The degree to which a landowner is responsible for actions (or inactions) which affect others. (This is also a Political factor.)
 - C. Litigation procedures:** How disputes regarding management of public and private forest lands are dealt with. (This is also a Political factor.)
- 2. Political factors:** Influences which are decided by legislators or administrators. The factors can be changed by the policymakers.
 - A. Regulations:** Activities which prohibit or require extra costs to accomplish something. (An alternative approach to accomplish the same results may be to offer incentives, described below.)
 - B. Budgets:** Allocation of money to enact certain incentives on private lands and to undertake certain activities on public lands.
 - C. Administrative procedures:** Decisions to follow certain procedures to fulfill a requirement, accomplish an objective, or comply with a law.
 - D. Landowner liability:** The degree to which a landowner is responsible for actions (or inactions) which affect others. (This is also a Social factor.)
 - E. Land ownership:** Much of the decision of who decides how the land is to be managed, who bears the responsibility (and profits and loss) for managing it, and who decides to sell or abandon it are the responsibility of the landowner. Land ownership can roughly be divided into three categories: public, industrial private, and non-industrial private.
 - F. Land allocation:** Who owns the land, and what regulations and incentives will be attached to it to try to achieve certain conditions.
 - G. Litigation procedures:** How disputes regarding management of public and private forest lands are dealt with. (This is also a Social factor.)
 - E. Transitional actions:** Even if a decision is made to change a forest condition, intermediate actions to avoid hardship/cost/confusion often are so onerous that the change is not worth doing.
- 3. Economic factors:** Influences which are based on people's ability to obtain wealth from their actions or ownership. These factors can be changed by incentives, regulations, or changes in technology.

A. Material and energy use practices: The choice of using wood and other forest products or their substitutes.

B. Technical and manufacturing capacity and equipment: The availability of technical equipment to accomplish a task. (This is also a technical issue.)

C. Finance needs: The ability to invest in various pieces of equipment, land, and processing facilities to implement forest management.

D. Bookkeeping: The accounting procedures which decide which costs and/or values a landowner (or government agency) personally expend and/or receive and which costs and/or values are borne/enjoyed by a larger segment of society--or the public at large.

4. Educational factors: Influences which are based on the level and kind of knowledge and understanding people have of the various conditions, influences on conditions, and issues. These can be changed through formal education, public forums, and news and entertainment outlets (e.g., newspapers, books, magazines, television, radio, video, "information superhighway", and others).

A. Landowner knowledge: The degree to which the landowner is aware of economic opportunities, legal constraints, and various alternatives for managing the land.

B. Public knowledge and education: The degree to which the public is aware of the conditions and behavior of forest and forest management relative to providing the various values.

5. Technical factors: Influences based on the technical ability to accomplish something at a reasonable effort. These can be changed through research and development.

A. Technical and manufacturing capacity and equipment: The availability of technical equipment to accomplish a task. (This is also an economic issue.)

B. Management Practices: Those practices which alter or prevent alteration of the forest resource.

While it is important to be aware of the factors which influence our forests' present conditions, making changes to these factors will be counterproductive until an overall policy for managing forests is agreed-upon. (For example, it may be inappropriate to allocate large budgets to manage public lands if the agreed-upon management policy is to curtail active management--or to allocate budgets for incentives on non-industrial private lands if the policy is for these landowners to manage for their maximum financial efficiency by growing timber products.)

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Part #4 will describe alternative policies for managing our forests--and the tradeoffs among values for each policy. A policy needs to be decided upon by policymakers. Once decided, the factors described above can be used as a "checklist" to design specific actions to achieve the chosen policy.